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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/253,306	02/19/1999	DONALD S. GARDNER	042390.P5832	5456

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EXAMINER

TRAN, THIEN F

ART UNIT

PAPER NUMBER

2811

DATE MAILED: 06/02/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/253,306

Applicant(s)

GARDNER ET AL.

Examiner

Thien Tran

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-- The MAILING DATE of this communication appears on the cover sheet with the corresponding address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 4-6, 9-11, 14-16 and 19-22 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 4-6, 9-11, 14-16 and 19-22 is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on ____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on ____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. ____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) ____.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). ____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

DETAILED ACTION

Response to Arguments

In view of the appeal brief filed on 03/04/2003, PROSECUTION IS HEREBY REOPENED. New grounds of rejection are set forth below.

To avoid abandonment of the application, appellant must exercise one of the following two options:

(1) file a reply under 37 CFR 1.111 (if this Office action is non-final) or a reply under 37 CFR 1.113 (if this Office action is final); or,

(2) request reinstatement of the appeal.

If reinstatement of the appeal is requested, such request must be accompanied by a supplemental appeal brief, but no new amendments, affidavits (37 CFR 1.130, 1.131 or 1.132) or other evidence are permitted. See 37 CFR 1.193(b)(2).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 4-5, 9-10, 14-15 and 22 are rejected under 35 U.S.C. 102(b) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Lee et al. (USPN 5,641,992).

Lee et al. discloses an interconnection (Fig. 1) on a substrate of an integrated circuit comprising an aluminum copper titanium alloy layer 24, wherein the aluminum

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copper titanium alloy layer (Table I) comprises 0.15 % titanium, 0.5 % copper and the remainder is aluminum. Lee et al. does not specifically disclose the percent as atomic percent or weight percent. Assuming it is the atomic percent then the aluminum alloy layer of Lee et al. read on the claim. On the other hand if the percent is the weight percent, then the atomic percent of titanium and the atomic percent of copper in the alloy layer 24 of Lee et al. are close enough that one skilled in the art would have expected them to have the same properties. Furthermore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to form the alloy layer of Lee et al. having the claimed range of atomic percent for the titanium and copper in the alloy, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art (see MPEP 2144.05).

Regarding claim 22, Lee et al. discloses the interconnect having composition of titanium, copper and aluminum as claimed, it is inherent that the interconnect has a resistance in the claimed range.

Claims 6, 11, 16 and 19-21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Inoue et al. (USPN 5,635,763) in view of Lee et al. (USPN 5,641,992).

Inoue et al. discloses a semiconductor device comprising a multilayered interconnection structure (Figs. 3A-3B) formed on a substrate 1, the interconnection comprises a second titanium nitride layer 9 overlying a second titanium layer 21, an aluminum alloy layer 10 overlying the second titanium nitride layer 9, a first titanium

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layer 23 overlying the aluminum alloy layer 10, and a first titanium-nitride layer 11 overlying the first titanium layer 23. Inoue et al. does not explicitly disclose the layer 10 being an aluminum-copper-titanium alloy layer. Lee et al. as described above discloses an aluminum-copper-titanium alloy layer. It would have been obvious to a person having ordinary skill in the art at the time the invention was made to form the aluminum alloy layer 10 of Inoue et al. comprising aluminum-copper-titanium as taught by Lee et al. so that the interconnection structure has improved electromigration reliability and low resistance. As a result, the alloy layer 10 comprises aluminum-copper-titanium wherein the percent of titanium and copper in the alloy if considered as atomic percent read on the claims. On the other hand, if the percent is weight percent then the atomic percent of titanium and the atomic percent of copper in the alloy layer 10 are close enough that one skilled in the art would have expected them to have the same properties.

Furthermore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to form the alloy layer 10 having the claimed range of atomic percent for the titanium and copper in the alloy, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art (see MPEP 2144.05).

Conclusion


Any inquiry concerning this communication or earlier communications from the examiner should be directed to Thien Tran whose telephone number is (703) 308-4108. The examiner can normally be reached on 8:30AM - 5:00PM Monday through Friday.

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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Tom Thomas can be reached on (703) 308-2772. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 872-9318 for regular communications and (703) 872-9319 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

tt
May 21, 2003


TOM THOMAS
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2800